REMARKS

Applicants have carefully reviewed the contents of the Office Action mailed June 4, 2004. Reconsideration is respectfully requested in view of the foregoing amendments and the comments set forth below.

By this Amendment, claims 1, 18-19 and 27 are amended to recite the result of the invention. Accordingly, claims 1-29 are pending in the present application.

Claims 1, 3-7 and 16-18 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,055,330 to Eleftheriadis, et al (hereinafter referred to as "Eleftheriadis") as explained in paragraph 2 spanning pages 2 and 3 of the Action. In addition, claims 1, 8-11, 18-21 and 25-27 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,729,295 to Okada as described in paragraph 3 of the Action. These rejections are respectfully traversed.

As described in the Field of the Invention and the Summary of the Invention of present application, the claimed invention is directed to a bit allocation technique for object-based video encoding. As described on page 8, lines 1-4 of the present application: "the inventors determined that if the bits per pixel is the same for the background composite and the foreground regions, the quality of the background composite and the foreground regions in the reconstructed video can be expected to be similar" (emphasis provided). That is, Applicants' invention ensures that reconstructed video sequences have similar visual quality on both the foreground and background regions so that the background and foreground would look more natural to a human viewer even under a very low bit-rate compression. According to claim 1, this is achieved by encoding the

video sequence based on balancing bits per pixel for said background composite with bits per pixel for said foreground regions. Claim 18 is directed to an apparatus and includes "means for encoding said video sequence based on balancing bits per pixel for said background composite with bits per pixel for said foreground regions. Claims 19 and 27 are directed to a method and apparatus respectively which include, among other features, "determining a background quantization step for said background composite based on a number of bits for a compressed background composite and an actual number of bits for said compressed background composite and "determining a starting foreground quantization step for said foreground regions based on said background quantization step and a desired bit-rate. The inventive method and apparatus obtain a pleasing reconstructive video sequence in that the reconstructed quality of the background composite and the foreground regions should be similar.

Eleftheriadis is directed to apparatus and methods for identifying one or more separate objects within depth information which correspond to a field of a frame of video information. That is, the focus of Eleftheriadis is on foreground object segmentation. It is the Action's position that Fig. 15 of Eleftheriadis at 1600 detects and separately encodes background and foreground and then supports this position with Fig. 4 and columns 8 and 9 that are directed to a single stream (MPEG-2) system. According to Eleftheriadis, the depth information is used in an encoder "so that more bits are spent in the more significant objects, thus resulting in higher visual quality, and less bits are spent in the least significant objects such as the background". See column 8, lines 58-61 of Eleftheriadis. That is, Eleftheriadis discloses that the encoder uses more bits in the foreground than in the background. Thus, Eleftheriadis cannot disclose the claimed

step of "encoding said video sequence based on balancing bits per pixel for said background composite with bits per pixel for said foreground regions" as set forth in claim 1. Likewise, Eleftheriadis fails to disclose the claimed means for encoding the video sequence based on balancing bits per pixel for said background composite with bits per pixel for said foreground regions" as set forth in independent claim 18. Accordingly, it is respectfully submitted that Eleftheriadis cannot anticipate claims 1, 3-7 and 16-18 because it fails to disclose the claimed encoding based on balancing bits per pixel of the background with bits per pixel of the foreground regions.

While column 16, lines 14-17 of Eleftheriadis discloses a video object segmentation circuit 1500 that uses the depth information to robustly separate visual objects and provides video object shape information to the MPEG-4 encoder 1600 to encode the separated visual objects separately, Eleftheriadis does not disclose that the encoding of the video sequence is based on balancing bits per pixel at the background with bits per pixel for the foreground in columns 16-19 of Eleftheriadis. In contrast with the claimed invention, Eleftheriadis states that object-based compression requires identification of areas of potential perceptual importance and identification of individual object areas. Nowhere does Eleftheriadis disclose balancing bits among the foreground and the background. Accordingly, Eleftheriadis cannot anticipate the claimed invention and withdrawal of this rejection is respectfully requested.

Okada is directed to an image sequence encoding device and an area extracting device where a specified area and a motion area are extracted from an input image and encoded by allocating a relatively increased amount of codes to the specified area and a relatively reduced

amount of codes to the motion area to improve the quality of the specified area of the image. This is not the claimed invention. Okada does not describe balancing bits per pixel for the background composite with bits per pixel for said foreground region. To the contrary, Okada encodes different regions in an image under different encoding qualities in order to emphasize certain portions of the image by using more bits for that particular region. Accordingly, Okada fails to disclose the encoding step of independent claim 1 and the means for encoding set forth in independent claim 18 that require a balancing of bits per pixel for the background composite with bits per pixel for the foreground regions. Accordingly, Okada cannot anticipate claims 1, 8-11 and 18 and withdrawal of that rejection is respectfully rejected.

Concerning independent claims 19 and 27, it is the Action's position that "the limitations claimed are substantially similar to claims 1 and 11" (Page 4, lines 1-2 of the Action). However, claim 19 recites determining a background quantization step for the background composite based on a number of bits for a compressed background composite and an actual number of bits for the compressed background composite and determining a starting foreground quantization step for the foreground regions of a video sequence based on the background quantization step and a desired bit rate. However, Okada merely discloses "an encoding control portion that receives effective/ineffective information representative of a face area and a background area from the area extracting portion and information on occupation of the buffer memory with coded information to determine respective quantizer stepsizes (intervals) for quantizing the face area and the background area" as described in column 2, lines 16-27 of Okada. This is not determining a background quantization step for the background composite based on a number of

bits for a compressed background composite and an actual number of bits for the compressed background composite; nor does this passage describe determining a starting foreground quantization step for the foreground regions based on the background quantization step and a desire bit-rate. To the contrary, Okada merely states that a reference quantizer stepsize may be determined on the basis of the occupied size of the buffer memory and selects a smaller quantizer step size for a face area than that for the background area. Independent claim 27 is an apparatus claim based on the method of claim 19. Accordingly, Okada fails to disclose determining a background quantization step according to claims 19 and 27 and determining a starting foreground quantization step based on the background quantization step as set forth in independent claims 19 and 27. Consequently, Okada cannot anticipate claims 19-21 and 25-27 and withdrawal of this rejection is respectfully requested.

Claims 12-15, 22-24 and 28-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Okada in view of U.S. Patent No. 5,990,957 to Ryoo as explained in paragraph 5 spanning pages 4 and 5 of the Action. This rejection is respectfully traversed.

As argued above, Okada fails to disclose balancing the bits per pixel of the background with bits per pixel of the foreground regions. Nowhere does Ryoo disclose, teach or suggest balancing the bits per pixel of the background composite and the foreground regions. Accordingly, claims 12-15 should allowable over any combination of Okada and Ryoo at least for those reasons. In addition, Ryoo also fails to discuss achieving a similar quality between the background composite and foreground regions in a reconstructive video sequence as recited in amended independent claims 1, 18-19 and 27. The traditional way of controlling compression

quality of a video using quantization steps is not sufficient for object-based coding of a video because the same quantization step for the background and foregoing regions will correspond to different visual quality on these two different regions. As a consequence, object segmentation artifacts emphasized in an encoded video thus significantly decrease the visual quality of the reconstructed video. Accordingly, it is respectfully submitted that one of ordinary skill in the art would not have considered the teachings of Ryoo to modify and cure the deficiencies of Okada.

Ryoo is directed to a video signal bit amount control using adaptive quantization. That is, Ryoo describes an apparatus for controlling the bit amount of each video object plane (VOP) of a moving picture, the quantization step size (which reflects the encoding quality) is determined based on the significance, complexity and color sensitivity of each VOP. Unlike the present invention, Ryoo's focus is on encoding different foreground objects for an object-based encoding system. Nowhere does Ryoo mention achieving a similar quality between the background composite and the foreground regions in a reconstructed video sequence. Thus, Ryoo has a completely opposite objective than that of the claimed invention. Since Ryoo mainly focuses on the foreground VOP encoding, Ryoo's system is designed to selectively emphasize certain foreground objects by assigning different number of bits for different foreground objects. To the contrary, the claimed system tries to make the composite of the foreground and the background as natural as possible.

Nowhere does Ryoo disclose, teach or suggest determining a background quantization step for the background composite based on a number of bits for a compressed background composite and an actual number of bits for said compressed background composite and

determining a starting foreground quantization step for the foreground regions based on the background quantization step and a desired bit rate. Accordingly, Ryoo does not disclose, teach or suggest the features missing from Okada with respect to independent claims 19 and 27. Accordingly, it is believed that no combination of Okada and Ryoo could render obvious the claimed invention of independent claims 19 and 27 and their dependent claims 20-26 and 28-29, respectively. Accordingly, withdrawal of the rejection under 35 U.S.C. § 103(a) under Okada in view of Ryoo is respectfully requested.

Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Okada in view of U.S. Patent No. 5,778,098 to Lee et al (hereinafter referred to as "Lee") for the reasons set forth in paragraph 6 of the Action. This rejection is respectfully traversed.

Lee is directed to sprite coding to increase video compression efficiency. The Action applied Lee for its teaching of "warp point defined as sprite is to be warped to create the background" (see page 5, lines 15-16 of the Action). Claim 2 depends from independent claim 1, which recites encoding the video sequence based on balancing bits per pixel for background composite with bits per pixel for the foreground regions and adds that the bits per pixel for the background composite is based on a number of bits in a compressed background composite, a number of bits for warp points of the background composite, and a number of pixels in the background composite. Thus, the claimed invention is directed to balancing the foreground and background encoding bits based on a number of bits for warp points of the background composite and not encoding warping points as an encoding procedure. While Lee discusses "warping" and the fact that "warping information" is encoded, this is not the claimed invention

set forth in dependent claim 2.

Moreover, Lee fails to disclose, teach or suggest balancing the bits per pixel for the background composite with the bits per pixel for the foreground regions to encode the video sequence as set forth in independent claim 1 and argued above as being missing from Okada. Accordingly, Lee cannot cure the deficiency of Okada and cannot render the claimed invention obvious as it fails to disclose, teach or suggest the balancing bits per pixel for the background composite with the bits per pixel for the foreground regions to encode the video sequence in order to achieve similar quality between the background composite and the foreground regions in a reconstructive vide sequence. Accordingly, withdrawal of this rejection is respectfully requested.

In view of the above, it is respectfully submitted that independent claims 1, 18-19 and 27, as well as their dependent claims, 2-17, 20-26 and 28-29 are patentable over the art of record. Reconsideration and allowance of the present application is respectfully requested.

A request for the necessary extension in the period for filing this response, as well as a check in payment of the applicable extension fee are attached. Should no remittance be attached, or should any greater or lesser fee be required, please charge or credit our Account No. 22-0261 and advise us accordingly.

If the Examiner believes that a conference would help to advance the prosecution of the present application, the Examiner is encouraged to telephone the undersigned at the number below.

Respectfully submitted,

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